DOCUMENT RESUME

ED 210 194 SE 035 955

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TITLE ERIC Clearinghouse for Science, Mathematics, and Environmental Education Fact Sheets. Nos. 1, 2, 3, 4, 1981.
INSTITUTION ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, Ohio.
SPONS AGENCY National Inst. of Education (ED), Washington, D.C.
PUB DATE 81
CONTRACT 400-78-0004
NOTE 11p.
AVAILABLE FROM Information Reference Center (ERIC/IRC), The Ohio State Univ., 1200 Chambers Rd., 3rd Floor, Columbus, OH 43212 (subscription for four sheets $3.00; back issues and single copies $1.00).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Conservation Education; Elementary Secondary Education; *Environmental Education; Higher Education; *Learning Activities; Outdoor Education; *Program Evaluation; *Resource Materials; *Simulation; *State Departments of Education

ABSTRACT

Four fact sheets discuss topics of interest to environmental educators. Number one addresses the relative lack of effective evaluation of environmental education programs. It emphasizes the need to base evaluation on identified goals and objectives and cites an accepted goal statement. Two examples of evaluation methods are given as well as suggestions for further reading. Number two discusses different kinds of simulation games, their purpose, basic components and value to environmental education. An extensive reference list is included. Fact sheet number three explains the purpose and advantages of learning activities for environmental education and describes materials prepared by Stapp and Cox; Area Cooperative Educational Services; Upper Mississippi River ECO-Center; the ERIC Clearinghouse for Science, Mathematics and Environmental Education; and others (materials listed and cited in these three fact sheets are available through ERIC). Number four presents generalizations about the characteristics, duties, and responsibilities of the officially designated contact persons for environmental education in state education agencies. Names and addresses for all fifty individuals are listed. A coordinating association for these individuals is also described. (DC)

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ERIC/SMEAC Environmental Education Fact Sheet No. 1, 1981

Environmental Education Program Evaluation

With the growth of public awareness about environmental concerns since the late 1960s, there has been an equivalent increase in the number of environmental programs conducted by educational institutions. However, little systematic evaluation of the effectiveness of programs — assessments of curriculum materials, gains in student knowledge, attitude shift, teacher effectiveness — has taken place. This may be in part attributed to the identification of need to establish programs within schools by educators in response to their perceptions of the seriousness of environmental problems; evaluation of these efforts has been of lower priority.

Unlike most established areas of study, environmental education is by its nature interdisciplinary, virtually a part of every curricular area. Other characteristics include its emphasis on the process of learning, concern with the refinement of problem solving skills, and use of the community as a learning resource. Because of these complexities, educational researchers have not made concerted efforts to determine the degrees of effectiveness in attaining affective, cognitive, or behavioral skill objectives.

The purpose of this fact sheet is to provide an overview of assessment considerations pertaining to environmental education. A search of the ERIC files provides some evaluation formats used by schools, and their recommended evaluation procedures. Those persons involved in evaluation efforts in environmental education will find much in these files that will be of assistance.

Identification of Goals and Objectives

The relatively early stages of development in environmental education suggest that evaluation systems will not emerge until more consistent objectives, cognitive and other, evolve. Nevertheless, the time is appropriate now for those persons familiar with the goals of environmental education, along with those individuals knowledgeable about assessment procedures, to review the area and its impact on individual students and the educational institution. In an era of tightening budgets, assurances that environmental education is of central priority, and not a frill, are required.

To enhance environmental education efforts, a common, clear, comprehensive goal statement should be established. A commonly-accepted statement which has been repeated numerous times, with variations, is:

> Environmental Education is the process aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward their solution. (Stapp, 1973).

An analysis of this definition indicates the range of assessment tools required. Because environmental education is defined as a "process," measurement of the individual's understandings of the methods and effects of various systems is essential. To produce a citizenry that is knowledgeable concerning the biophysical environment and its associated problems indicates that its audience is the broadest range of students in continuous learning situations throughout their lives. Implicit in this statement is the recognition of the need to evaluate environmental relationships. Becoming aware of how to help solve environmental problems offers a challenge to those involved in assessing problem solving activities. Becoming aware of the problems and applying knowledge and skills from scientific, technical, social/political, and economic areas of study and their interrelationships requires careful interpretation and assessment. Motivation to work toward the solution of these problems is without question the most difficult component to evaluate. Motivation is a personal quality; dedication to work toward the solution of environmental problems depends squarely on the individual's values and attitudes.

Evaluation Needs

Evaluation generally involves the generation, measurement, analysis, and interpretation of data. Some evaluation activities require formal evaluation approaches that are designed to generate conclusive data, while others are management information approaches that result in data upon which decisions must be based. Both reliability and validity are required if the evaluation results are to be considered adequate. Validity is an estimate of the degree to which an evaluation procedure measures what it is designed to measure, while reliability indicates that similar results can be obtained by repetition under similar circumstances.

The New Jersey State Council for Environmental Education developed an evaluation instrument utilizing a systems analysis approach for self-evaluation, for use by project directors (ED 033 801). Categories highlighted in this approach (planning and design, content, operation, productivity) provide guidelines which must be considered in the conduct of a comprehensive environmental education evaluation scheme.

The Colorado Department prepared a two-volume *Environmental Education Needs Assessment and Evaluation Manual* (ED 199 093, ED 199 094) providing additional guidance for the implementation or refinement of programs. Both formative and summative evaluation are considered; a competent evaluator must be both a scientist and an expert in human relations to accomplish this. The evaluator's role requires organizational skills, knowledge of evaluation methods and strategies, and communication skills. Many factors — time, funds, staff assistance, cooperation — influence outcomes. Therefore, use of a systematic approach can create confidence of others in the procedure, and assure that data produced are properly used.

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Evaluation Design

The Colorado *Manual* describes five major steps, and several activities, necessary in conducting an evaluation. They include:

1. Develop an evaluation design
   a. Determine the purpose; discuss with key people, reviewing the proposal, law, and needs assessment. Then list the formative and summative questions.
   b. Determine the data to be collected; select major questions to be answered, list alternative data possibilities, review cost and feasibility, then select the appropriate approach.
   c. Prepare a time line and cost estimates.
   d. Write the evaluation plan; review with key administrators and staff.
2. Select and/or develop instruments
   a. Search for existing instruments.
   b. Review existing instruments.
   c. If needed, modify existing instruments or construct new ones.
   d. Pilot instruments and proposed data analysis procedures.
   e. Consider reliability and validity.
3. Collect appropriate information
   a. Set up appointments.
   b. Inform people of what to expect.
   c. Willingly reschedule, if requested by respondents.
   d. Give advance notice, if you must delay data collection.
   e. Use a consistent set of instructions and methods for data collection.
4. Analyze data
   a. Plan and pilot analysis before collecting the evaluative data.
   b. Aggregate or prepare data.
   c. Conduct statistical analyses as appropriate.
   d. Use data analysis consultant when/if needed.
   e. Interpret the results of the analysis.
5. Prepare and present reports
   a. Concentrate on the message of the analysis; prepare recommendations.
   b. Prepare short summaries of each report.
   c. Use alternative forms of reports, oral and written.

Accountability to the community, to funding agencies, and to students is a primary force requiring systematic evaluation of environmental education programs. Detailed information related to the achievement of cognitive and non-cognitive objectives is needed to justify programs and assure that students are prepared to deal with the numerous conservation, pollution control, energy, reclamation, and other environmental issues that will face them as they mature and become primary decisionmakers.

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This publication was prepared with funding from the National Institute of Education, U.S. Department of Education under contract no. 400-78-0004. The opinions expressed in this report do not necessarily reflect the positions or policies of NIE or the Department of Education.

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ERIC/SMEAC Environmental Education Fact Sheet Number 2 **1981**

Simulation Activities for Environmental Education

The use of simulation exercises to improve student learning and interpersonal skills has become increasingly common in educational settings. Beginning with simple role-playing games, these instructional tools have evolved to include complex computer-based simulations which can mimic a wide variety of technical and social situations. Simulation exercises are flexible: they can be devised to be narrow in concept or to encompass many concepts. They can be designed to be short problem solving activities that can take just a few minutes to complete or to continue over long periods of time.

Few educators will dispute the desirability of providing direct learning experiences. When students are unable to participate in such experiences, simulations should be considered. A simulation is a selective representation of reality, containing only those elements of reality relevant to identified instructional objectives.

Why Use Simulation Activities?

It is assumed, and appears to be accepted by teachers, that in addition to increasing the rate of acquiring basic skills and knowledge, simulation games also motivate individual student performance to levels beyond those achieved through traditional classroom approaches. As with all instructional methods, simulation exercises cannot replace proved instructional techniques. Rather, they are best used where traditional methods are not adequate. This is particularly evident where direct experiences are not possible, as illustrated by the following list of occasions appropriate to the use of simulations (Visich and Braun, 1974, pp. 4-7):

1. The necessary equipment is not available because of expense, or it is too complex or delicate to permit students to use it . . .;
2. The sample size available in the real world is too small to permit generalizations . . .;
3. The experimental technique is difficult and must be developed over an extended period . . .;
4. There are serious dangers to the student . . .;
5. The time scale is too short or long to permit the student to make observations . . .;
6. The opportunity to experiment directly is not available . . .;
7. When it is desirable to measure variables which are difficult to access . . .;
8. When measurement and other noise obscure the important phenomena . . .;
9. There are times when it is useful to underscore the significance of natural laws by comparing their results with other laws . . .

What Are the Components of Simulations?

The basic characteristic of all simulations, whether they are simple games or complex computer-based systems, is that they allow one to construct a representation of some real object or process and then experiment with the representation rather than with the real object or process. A simulation game has four basic components: (1) an abstraction of an environment, (2) a series of rules for how the model behaves, or models interact (this is the simulation), (3) the freedom for the participant to interact with the simulation to develop strategies (this is the game), and (4) "reality" feedback (which is what makes it come alive) (Flake, 1974, p. 4).

What Can Simulations Contribute to Environmental Education?

Environmental education objectives are often well-served by use of games and simulations. The environment itself is an imposing complex of interacting systems; achieving understanding of the components and operations of the systems is a massive task, further magnified when inter-system interrelationships are of concern. Because dealing with the environment calls for such understandings prior to or concurrent with the tasks of decision making, and because manipulation of large-scale environmental components is generally impractical or impossible, games and simulations offer the best available opportunities to provide practice in manipulation and decision making, with the added advantage of giving students the opportunity to see, and evaluate, the results of their efforts.

Computer simulations have characteristics similar to those of classroom games. The primary differences are the resources available for communicating with the learner. Computer simulations can provide consistent responses to many questions and store large amounts of relevant information. In addition to large and often expensive computers, a microcomputers are now available that are inexpensive and can be readily programmed by teachers and students.

How Can Use of Simulations Enhance Decision Making?

Another characteristic of simulations is their ability to enhance the decision making abilities of participants.

> In order to function in our rapidly changing society, today's educated person must be able to look objectively at his habitat, to analyze his needs, to manipulate his environment, to meet those needs and at the same time to look forward to future generations' needs, to evaluate his actions, and to reorganize his mode of operations if it is indicated. The success of each of these personal actions . . . is tangent on the single skill—decision making. Most educators give students opportunities to communicate, to be objective, to analyze. Some teachers provide for the experience of evaluation and speculation. Few teachers allow manipulation of society through role-playing. Rarely is the student given the nod to reorganize and try again (Amoe, 1976, p 5).

Simulation games provide students with opportunities to refine decision making skills. Those who use simulations believe that these skills can be learned and refined, just as other skills are learned and refined, and that simulations can play an important function in the learning process.

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This publication was prepared with funding from the National Institute of Education, U.S. Department of Education under contract no. 400-79-0004. The opinions expressed in this report do not necessarily reflect the positions or policies of NIE or the Department of Education.

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ERIC/SMEAC Environmental Education Fact Sheet No. 3 **1981**

Learning Activities for Environmental Education

The use of structured activities to improve learning is not a new strategy. Ivan Illich, stating in 1971 that "If a person is to grow up, he needs first of all access to see, to touch, to tinker into, to grasp whatever there is in a meaningful setting," is restating what John Dewey promoted two generations ago (Coon and Bowman, 1977, p. 12). Children learn more readily by actively doing something rather that by just reading and talking about it. In addition to its broad implicatons for all of education, this specifically suggests that environmental education will be more effective if activities in meaningful settings precede and/or accompany reading about and discussing environmental concerns.

Much of the renewed emphasis on environmental education is due to the continuing concerns confronting society. Complex environmental problems make it imperative that students understand the environmental issues facing society and become prepared to be involved in solutions through intelligent action. Reasoned judgements should result from educational experiences that develop knowledge through understanding of concepts and interrelationships, along with clarification of values.

Advantages of Environmental Education Activities

Appropriate educational activities offer a number of experiences to those who must be prepared to make environmental decisions in the future. Activities are relatively easy to introduce in already overcrowded curricula. They can be flexible, allowing teachers to select complex units requiring several months for completion, or to choose short, simple experiences that take just a few minutes. Another advantage is that many activities are rooted in existing curricular areas such as art, home economics, industrial arts, language arts, mathematics, music, science, and social studies. Almost all activities are structured around real objects and events which are frequently encountered.

Using the community as a resource provides students with opportunities to become familiar with community concerns, as well as with community capabilities. Experts within communities can offer valuable insights and knowledge that teachers cannot be expected to provide.

Environmental education activities can be relatively easy to develop and implement, even when the school provides limited support. If time does not allow for the development of new activities, thousands of activities, on many topics, have already been developed and may be readily adapted.

Environmental Education Activities Manual

William B. Stapp and Dorothy A. Cox suggest that the following environmental concepts can be explored through activities: ecosystem, population, economics and technology, environmental decisions, and environmental ethics. These concepts are addressed in their revised environmental educaton activities manual, containing more than 300 activities for elementary and secondary school students. Four activity sections follow an introductory chapter on the philosophy, model, and implementation guidelines for the "people-environment interaction" perspective upon which they focus. Lessons in all activity sections are identified by grade level.

Reference: Stapp and Cox, *Environmental Education Activities Manual, Revised Edition*. October 1979. MF $1.48. ED 199 092

Area Cooperative Educational Services (ACES)

The Environmental Education Center of New Haven (Connecticut) Area Cooperative Educational Services has produced a number of major activities publications in environmental education. Among them are a two volume set dedicated to producing environmentally literate citizens who are equipped with factual, unbiased information, skilled in problem-solving and decision-making, and motivated to take active roles in working toward the maintenance of an ecologically sound environment. One is oriented toward students in grades 3-5; the other, for grades 6-8. The activities package in each document is organized in seven sections, based on environmental topics: ecosystems, population, energy and resources, economics, technology and culture, environmental quality, environmental policy, and environmental ethics. Each activity includes a curriculum topic, an environmental topic, a list of skills exercised in activity, subject, grade level, location necessary to carry out the activity, objective, vocabulary list, and related activities and resources.

References: Larry Schaefer and Nancy Hungerford, editors, *Earthwatch: Designing Environmental Education into the Curriculum, Volume I, Grades 3-5*. 1978. MF $0.93; PC $30.05. ED 170 151

Schaefer and Hungerford, editors, *Earthwatch: Designing Environmental Education into the Curriculum, Volume II, Grades 6-8*. 1978. MF $0.91; PC $15.20. ED 170 152

Upper Mississippi River ECO-Center

A number of publications containing environmental education activities have been produced by the Upper Mississippi River ECO-Center, Thomson, Illinois. Each publication covers a specific discipline area. Most of the activities include objectives, description, evaluation, and grade level information.

References: Helen Whitney, compiler, *101 Environmental Education Activities, Booklet 1 - Art and Music Activities*. 1975. MF $0.91; PC $2.00 ED 165 972

Helen Whitney, compiler, *101 Environmental Education Activities, Booklet 2 - Language Arts Activities*. 1975. MF $0.91; PC $3.65. ED 165 973

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Helen Whitney, compiler, *101 Environmental Education Activities, Booklet 4 - Science Activities*. 1975. MF $0.91; PC $13.55 ED 165 975

Helen Whitney, compiler, *101 Environmental Education Activities, Booklet 5 - Science and Social Studies (Interdisciplinary) Activities*. 1975. MF $0.91; PC $2.00. ED 165 976

Helen Whitney, compiler, *101 Environmental Education Activities, Booklet 6 - Social Studies Activities*. 1975. MF $0.91; PC $3.65. ED 165 977

Marian College

Trainable mentally retarded students can participate in environmental education activities developed by Marian College of Indianapolis, Indiana. Both out-of-classroom and in-classroom activities emphasize language skills, numerical skills, science, and attention span. The eight topical areas addressed are: air, animals, games, light, plants, seasons, soil, and water. The activities are described on separate cards and are written for the teacher.

Reference: Deborah Benedict and others, *Try These, We Have! Environmental Education Activities for the Trainable Mentally Retarded.* 1978. MF $0.91; PC $10.25. ED 134 434

SMEAC Information Reference Center

A comprehensive collection of environmental education activities volumes has been developed over the past decade by personnel for the ERIC Clearinghouse for Science, Mathematics, and Environmental Education and may be obtained in booklet form from SMEAC Information Reference Center or in microfiche or paper from ERIC Document Reproduction Service. Although each volume is somewhat unique in format, each generally includes a purpose statement, grade level, subject, concept, references, and description of the activity for each entry. A wide range of environmental education interests is addressed, including energy, land use, population, recycling, urban environmental education, and water.

References: Mary Lynne Bowman, *Teaching Basic Skills through Environmental Education Activities.* 1979. MF $0.91; PC $10.25; IRC $4.00. ED 196 704

Mary Lynne Bowman, *Values Activities in Environmental Education.* 1979. MF $0.91; PC $11.90; IRC $3.75. ED 182 118

Mary Lynne Bowman and Herbert L. Coon, *Recycling: Activities for the Classroom.* 1978. MF $0.91; IRC $4.95. ED 159 075

Mary Lynne Bowman and John F. Disinger, *Land Use Management Activities for the Classroom.* 1977. MF $0.91; PC $18.50; IRC $5.50. ED 152 541

Herbert L. Coon and Michele Y. Alexander, *Energy Activities for the Classroom.* 1976. MF $0.91; PC $10.25; IRC $4.95. ED 130 833

Herbert L. Coon and Mary Lynne Bowman, *Energy Activities for the Classroom, Volume II.* 1978. MF $0.91; PC $11.90; IRC $3.00. ED 173 072

Herbert L. Coon and Mary Lynne Bowman, *Environmental Education in the Urban Setting: Rationale and Teaching Activities.* 1977. MF $0.91; PC $13.55; IRC $4.40. ED 137 140

Herbert L. Coon and Charles L. Price, *Water-Related Teaching Activities.* 1977. MF $0.91; PC $11.90; IRC $4.40. ED 150 026

William R. Hernbrode, *Multidisciplinary Wildlife Teaching Activities.* 1978. MF $0.91; PC $6.95; IRC $3.30. ED 162 897

Robert H. McCabe, J. Terence Kelly, and Doris Lyons, *Man and Environment Teaching Alternatives.* 1977. MF $0.91; PC $23.45; IRC $6.60. ED 144 826

Alan J. McCormack, *Outdoor Areas as Learning Laboratories – CESI Sourcebook.* 1979. MF $0.91; PC $15.20; IRC $6.50. ED 183 374

Charles E. Roth and Linda G. Lockwood, *Strategies and Activities for Using Local Communities as Environmental Education Sites.* 1979. MF $0.91; PC $13.55; IRC $5.50. ED 194 349

Judith M. Schultz and Herbert L. Coon, *Population Education Activities for the Classroom.* 1977. MF $0.91; IRC $4.40. ED 141 178

John H. Wheatley and Herbert L. Coon, *One Hundred Teaching Activities in Environmental Education.* 1973. MF $0.91; PC $15.20; IRC $4.50. ED 091 172

John H. Wheatley and Herbert L. Coon, *Teaching Activities in Environmental Education, Volume II.* 1975. MF $0.91; PC $13.55; IRC $4.40. ED 125 868

Other Environmental Education Activities

Literally hundreds of environmental education activities publications have been developed over the past decade; many of them are available through the ERIC system. A few additional volumes are noted below, to provide still more examples. The reader should realize that this listing is far from exhaustive.

Allen, Rodney F., editor, *Okeechobee County Energy Education Activities - Middle School Level.* Tri-County Education Center. Sebring, Fl, 1981. MF $0.91. ED 201 523

Group for Environmental Education, Philadelphia, PA, *Suggested Activities Using the School and Its Surroundings as a Resource for Environmental Education.* 1972. MF $0.91; PC $12.00. ED 106 054

Klenzman, Elizabeth, and Paula Taylor, *Creating Futures Activity Cards and Teacher Guide.* Minneapolis, MN, Public Schools, 1979. MF $0.91. ED 201 561

Montgomery, Herbert, and Mary Montgomery, *Minnesota Energy Activities for Elementary Students.* Minnesota State Energy Agency, 1981. MF $0.91; PC $11.90. ED 200 445

National Association of Independent Schools, Boston, MA, *Interdependence: A Handbook for Environmental Education.* 1979. MF $0.91. ED 170 135

Scherner, Sharon, editor, *Conservation of Energy: Idea and Activity Guide, An Interdisciplinary Teacher's Guide to Energy and Environmental Activities.* Energy and Man's Environment, Inc., Portland, OR, 1979. MF $0.91; ED 200 424

Winslow, Donald R. *Multidisciplinary Education 31E: Environmental Studies, Study Guide.* Indiana University School of Continuing Studies, 1980. MF $0.91; PC $6.95. ED 201 501

Availability

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This publication was prepared with funding from the National Institute of Education, U.S. Department of Education under contract no. 400-78-0004. The opinions expressed in this report do not necessarily reflect the positions or policies of NIE or U.S. Department of Education.

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ERIC/SMEAC Science Education Fact Sheet Number 4 **1981**

The State Education Agencies and Environmental Education

Each of the fifty state education agencies has named at least one "official" contact person for environmental education. Responsibilities of these individuals vary from state to state for a variety of reasons, including the agency's organizational philosophy and the state's particular viewpoint of what environmental education is, or should be, in terms of the educational priorities and needs of the state.

In only nine states, California, Florida, Hawaii, Iowa, Minnesota, Ohio, Pennsylvania, South Carolina, and Wisconsin, is environmental education a fulltime assignment for one or more staff persons. A tenth, Colorado, has a full-time specialist in conservation education. In 31 states, the environmental education assignment is combined with or part of a science education assignment. Assignment patterns in the other nine states are diverse and not apparently generalizable.

Subsets and Adjuncts of Environmental Education

In terms of what constitutes the environmental education assignment of a state education agency contact person, a variety of patterns exists. Most commonly, though not in all cases, environmental education is defined to include *conservation education* and *outdoor education*. Frequently listed as either subsets or adjuncts are *energy education, marine-and-aquatic education, and/or population education.*

Responsibilities

Responsibilities of environmental education contact persons sometimes include networking with other states and/or federal agencies, but such duties normally are of a secondary nature. Generally, these individuals provide coordination within their own state education agencies and with other in-state agencies, such as resource management, conservation, and environmental protection agencies. They also provide consultant or specialist services for schools and teachers within their own states. In-service workshops and curriculum development and implementation are frequently part of their job assignments. A common corollary responsibility is in working with in-state teacher education institutions in the areas of pre-service and in-service programs.

State Environmental Education Coordinators Association

An organization created by these contact persons is the State Environmental Education Coordinators Association (SEECA). Its purpose is "to strengthen and promote the leadership role of state environmental education personnel." SEECA's annual meetings are concurrent with those of the National Association for Environmental Education. Current SEECA officers include.

President:	Teresa M. Auldridge, Virginia Department of Education
Vice-President:	Louis A. Iozzi, Rutgers The State University of New Jersey
Secretary:	John Hug, Ohio Department of Education
Treasurer:	Duane Toomsen, Iowa Department of Public Instruction
Past President:	Barry W. Jamason, New York State Department of Education

State education agency contact persons for environmental education are listed below. The listing was developed cooperatively by SEECA and ERIC/SMEAC in Spring 1981, with some updating through October 1981 included. Asterisks indicate current SEECA members. Names of SEECA members who are not "official" agency contact persons are also listed, with affiliations.

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This publication was prepared with funding from the National Institute of Education, U.S. Department of Education under contract no. 400-78-0004. The opinions expressed in this report do not necessarily reflect the positions or policies of NIE or U.S. Department of Education.